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REMEDIAL DESIGN
HABITAT MITIGATION PLAN
FORMER KOPPERS COMPANY, SUPERFUND SITE
MORRISVILLE, NORTH CAROLINA

DECEMBER 1994

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

LIST OF ATTACHMENTS

1.0 INTRODUCTION

1.1 Background

This document presents the Remedial Design Report for the Habitat Mitigation Plan for the Koppers Superfund Site, Morrisville, North Carolina. In June, 1993, Beazer East, Inc. submitted to the United States Environmental Protection Agency (U.S. EPA), Region IV, a work plan entitled "Remedial Design Work Plan for Koppers Company, Inc., Superfund Site, Morrisville, North Carolina" (Chester Environmental, Inc., June 1993), which was prepared to implement remedial design activities in accordance with the December 23, 1992 Record of Decision (ROD) and the April 21, 1993 Unilateral Administrative Order issued by the U.S. EPA. U.S. EPA approved the RDWP with revisions on September 2, 1993.

On January 31, 1994, the "Remedial Design Habitat Mitigation Plan, Former Koppers Superfund Site, Morrisville, North Carolina - Preliminary Report" was submitted to the U.S. EPA. Beazer received comments from U.S. EPA on the above report on March 9, 1994 and subsequently submitted responses to the comments to US EPA on March 25, 1994. In June 1994, a copy of the Preliminary Report for the Habitat Mitigation Plan was submitted to the National Resource Board of Trustees for their review and approval. Upon the Trustee's review of the Plan, EPA verbally approved the preliminary design for the habitat mitigation on August 29, 1994. During a telephone conference with U.S. EPA and representatives from the US Fish and Wildlife Service on August 29, 1994, Beazer also committed to the creation of a forested wetland over the remediated Medlin Pond area. The wetland creation in the Medlin Pond area was incorporated into the 90% Remedial Design submitted on September 29, 1994. On November 29, 1994, the 90% design was approved with comments. This report presents the Final Design of the HMP.

The proposed remediation of the Koppers Superfund Site, once implemented, will result in the loss of habitat consisting of two (2) shallow, man-made ponds and partial loss of wetlands. As described in the RDWP, a Habitat Mitigation Plan (HMP) will be implemented.

1.2 Document Purpose

The Design Report must fulfill several functions for the Habitat Mitigation Program. Each of these functions is important for the development and continuity of the program. The design requirements for the facility are defined. The design is presented along with a discussion of the permitting requirements. The attached Field Investigation Report discusses the general suitability of the site and various sites which were evaluated. Field data is discussed for the proposed site.

1.3 Document Scope

This document contains all of the information required by the RDWP. Section 2 provides a discussion on the suitability of the site in regards to existing habitat, site soils, site hydrology, and quality and size of the replacement system. Section 3 presents the design criteria for the Habitat Mitigation project. Section 4 provides a detailed description of the design and discusses the expected operation and design features. Section 5 discusses the permit requirements and provides a plan to obtain all necessary permits for the project.

Appendix A contains the Field Investigation Report and Appendix B contains correspondence with various agencies. Design calculations are provided in Appendix C and the Design Drawings are presented in Appendix D.

Attachment 1 contains the Construction Specifications, Attachment 2 is the Erosion and Sedimentation Control Plan, and Attachment 3 contains the Construction Quality Assurance Plan (CQAP). The Operation, Monitoring and Maintenance Plan is provided as Attachment 4. Attachment 5 presents a Wetland Delineation Report for the Seagondollar site. Information concerning land ownership is provided in Attachment 6.

2.0 SUITABILITY OF THE PROPOSED MITIGATION SITES

The existing habitats on the Koppers Superfund Site are identified in a Wetland Delineation Report (Chester Environmental, June 1992) which was included in Section 7.0 of the Remedial Design Work Plan (RDWP). In accordance with the U.S. EPA Record of Decision (ROD) issued January 4, 1993, wetland and open water habitat which will be impacted during the remediation of the site is to be replaced with habitat of similar values and functions. Two sites suitable for the mitigation project have been identified; the Seagondollar Site and the Medlin Pond Site.

This section of the report presents the detailed evaluation which was completed to establish the suitability of the proposed sites. The suitability determination catalogs the habitat value, soil types, geologic features and hydrologic factors of the units that will be impacted during the remediation and compares these features with the proposed sites. In addition, other factors for the proposed sites are considered such as land availability and ownership. The following sections of this report present the detailed evaluation of factors considered in the determination of the suitability of the proposed sites.

2.1 Habitat Value of the Existing Site

In order to characterize the suitability of the proposed mitigation sites, the value of the existing habitat must be examined. Two wetland units and two open water habitat units will be impacted when remediation of the site takes place. The two wetland units, that will be impacted at least to some degree, have been identified as units FP-3 and FP-7 (RDWP). The open water habitats that will be impacted are known as the Fire Pond and the Medlin Pond. Table 2-1 summarizes the values and functions for the existing wetland and open water habitat and indicates which functions will be included for the proposed mitigation habitat. Each of the four habitat units which will be impacted by remediation of the site are discussed in detail below.

TABLE 2-1

VALUES AND FUNCTIONS OF EXISTING VERSUS PROPOSED HABITAT

EXISTING HABITAT	PROPOSED HABITAT
Wetland	Wetland
Wildlife Habitat Storm Water Retention Water Quality	Wildlife Habitat Erosion and Sedimentation Control Storm Water Retention Water Quality Increased Vegetative Species Diversity Endangered/Sensitive Species Establishment
Open Water	Open Water
Wildlife Habitat Storm Water Retention Migrating Waterfowl Habitat Water Quality	Wildlife Habitat Storm Water Retention Migrating Waterfowl Habitat Water Quality

Wetland Unit FP-3

This unit, which surrounds approximately one-half of the Fire Pond, consists of a palustrine, scrub-shrub, broad-leaved, deciduous, intermittently exposed type wetland. Dominant vegetation in the wetland includes *Salix nigra* (black willow), *Juncus effusus* (soft rush), *Myrica cerifera* (southern bayberry), and *Baccharis halimfolia* (groundsel tree). A photo of this unit is included in Figure 2-1.

The unit provides values and functions which include migratory waterfowl habitat, small mammal habitat and habitat for wading and other bird species. The wetland may also provide functions such as water quality improvement by filtration and adsorption of certain constituents such as phosphorous, nitrogen, and metals and retention of flood waters during storm events. The wetland does not appear to be sufficient for nesting or rookery breeding areas for bird species and does not provide critical habitat for threatened or endangered species.

Soils in the wetland unit are listed as Colfax Sandy Loam, but are disturbed and contain hydric inclusions. Table 2-2 summarizes the soil types existing in the wetland units and expected for the proposed sites.

Wetland Unit FP-7

This unit fringes the drainage channel which hydraulically connects the Fire Pond to Medlin Pond. A photograph of this unit is included in Figure 2-1. It consists of a palustrine, forested, broad-leaved deciduous, seasonally flooded type wetland. The dominant vegetation in this unit consists of *Liquidambur styraciflua* (sweetgum), *Nyssa sylvatica* (black gum), *Toxicodendron radicans* (poison ivy), *Acer rubrum* (red maple) and *Quercus phellos* (willow oak).

The unit provides values and functions such as storm water retention, water quality improvements by filtration and adsorption, and wildlife habitat. The unit is surrounded by forested uplands and may have some importance to upland wildlife that occasionally forage or otherwise utilize forested wetland habitat. These organisms may include a variety of woodland species of birds, deer, and small

Vegetation Unit
FP-7

Vegetation Unit
FP-3

Koppers Superfund Site
Morrisville, North Carolina

Photographs of the Existing Wetlands Units

Figure 2-1

TABLE 2-2

SOIL TYPES IN EXISTING VERSUS PROPOSED HABITAT

EXISTING SOILS	PROPOSED SOILS
FP-3 Colfax sandy loam and White store sandy loam with: hydric inclusions histic epipedon reducing conditions gleying	Wetland Areas B-Horizon will be made up of those soils that are found on-site. A-Horizon soils will be made of 1-2 feet of topsoil from the site, if available, or brought from a local borrow source. As the soils become anaerobic hydric inclusions will become evident.
FP-7 Colfax sandy loam with: organic streaking gleying mottling sulfidic odors	Open Water Areas Clay from on-site or from a local borrow source will make up the substrate for the open water areas. In time as leaves coat the bottom and decay, an organic muck will form.

mammals. The wetlands do not provide habitat for migratory waterfowl and are not suitable for wading bird habitat or semi-aquatic mammal habitat (such as muskrat).

Soils in the unit consist of Colfax Sandy Loam with hydric inclusions. Table 2-2 summarizes the soil types existing in the wetland unit.

Fire Pond

The Fire Pond is a man-made pond which has since naturalized. It contains breeding populations of *Lepomis gibbosus* (Pumpkinseed) and *Lepomis macrochirus* (bluegill). This pond is heavily vegetated by algae, especially during the summer months. It is essentially a shallow pond with an average depth of 2.1 feet. Deeper areas of the pond were measured to be up to 5 feet in depth. Drainage from the pond flows via ditches and a culvert under Koppers Road to Medlin Pond.

On occasion, migratory waterfowl have been observed utilizing the pond. Primarily Mallard ducks have been seen. Other birdlife such as herons and belted kingfishers have been observed feeding in the pond. The pond also provides habitat to aquatic insects. Small mammals such as raccoon, fox, and muskrat have been observed in and around the pond.

The pond provides values and functions which include habitat for migratory waterfowl, food chain support, fish habitat, small mammal habitat, and aquatic invertebrate habitat. The pond is not exceptional value habitat due to the high number of other similar ponds in the Morrisville area that provide similar wildlife habitat. The pond is not known to provide critical habitat for threatened or endangered plant or animal species.

Medlin Pond

The Medlin Pond, also a man-made pond, is only somewhat naturalized and has a distinct man-made appearance. This pond contains two species of fish, *Micropterus salmoides* (largemouth bass) and bluegill. The fish are thought to have been stocked in this pond and they do not appear to be breeding here. The Medlin Pond was

measured to be as deep as 5.5 feet with an average depth of 1.9 feet. Drainage from the pond is to Crabtree Creek which, in turn, feeds the Neuse River. The pond contains little wetland-type habitat around its perimeter. The banks are primarily composed of mowed grass. Wildlife usage of this pond is minimal. Birdlife such as herons have been observed at the pond. There are no known observations of small mammal usage of the pond. It is expected, however, that the pond may support occasional use by this type of wildlife.

Medlin Pond provides minimal values and functions to the environment and is not critical to threatened or endangered species. Man-made ponds are very common in the region.

2.2 Habitat Value of the Proposed Site

2.2.1 Seagondollar Site

As is outlined in the Field Investigation Report (Appendix A), the area chosen for potential habitat enhancement consists of disturbed woodlands. Photographs of the proposed site are also included in the Field Investigation Report. The area contains some mature trees that are approximately 20-30 years old. Other woody vegetation is in the form of saplings (the dominant strata), vines and shrubs. Herbaceous vegetation in the understory is minimal.

The study area was most likely clear-cut 20-30 years ago and possibly selectively cut since then. The vegetation in the area is indicative of uplands as are the soils. Basically, there appear to be two units of vegetation in the study area which essentially follow elevation differences in the swale. The lower elevations within the swale, which contains an intermittent stream, are dominated by *Quercus alba* (White oak), *Liquidambar styraciflua* (sweetgum), and *Ulmus americana* (American elm) in the overstory. Dominant shrubs in this unit include *Juniperus americana* (Eastern red cedar), *Viburnum rufidulum* (rusty blackhaw), and *Lonicera japonica* (Japanese honeysuckle), which was present in both the vine and shrub variations. Saplings in this unit include *Liriodendron tulipifera* (white or tulip poplar), white oak, and *Pinus taeda* (loblolly pine).

Higher elevations in the study area are dominated by white oak and loblolly pine in the overstory. Dominant shrubs included *Ilex opaca* (American holly) and Eastern red cedar. Dominant saplings include white oak, white poplar and loblolly pine.

The Seagondollar property does not appear to contain any of the habitat requirements for threatened or endangered species as are listed for Wake County by the U.S. Fish and Wildlife Service. These species are: *Haliaeetus leucocephalus* (Bald eagle), *Picoides borealis* (Red-cockaded woodpecker), *Rhus michauxii* (Michaux's sumac), *Alasmidonta heterodon* (Dwarf wedge mussel), and *Vervmivora bachmanii* (Bachman's warbler). A copy of this list provided by the U. S. Fish and Wildlife Service is presented in Appendix B.

A site location map was provided to the State Natural Heritage Program for their input on threatened or endangered species as listed by the State of North Carolina. A copy of their comments is included in Appendix B.

By letter dated January 18, 1994, representatives of the State Natural Heritage Program stated that they "... do not have any record of known rare species, high quality natural communities, or significant natural areas occurring in the project area on the Cary Quadrangle." A list of rare species that are known to occur in Wake County were provided. This list was reviewed for habitat considerations and compared to habitat available at the Seagondollar Site. It does not appear that any of the habitat important for these species is available at the Seagondollar Site. A Wetland Delineation of the Seagondollar Property is provided in Attachment 5.

2.2.2 Medlin Pond Site

As stated previously, the Medlin Pond provides minimal values and functions to the environment and is not critical to threatened or endangered species. As determined in the Remedial Investigation/Feasibility Study (RI/FS) Report, the Medlin Pond will be remediated, which will add ecological value to the site. The addition of a forested wetland habitat to this area will significantly benefit the ecosystem as this type of

habitat is known to have very high wildlife value and is becoming scarce in the region as the area becomes developed.

2.3 Land Ownership and Availability

2.3.1 Seagondollar Site

The land area proposed for the mitigation is a rural area about 4,000 feet northwest of where Koppers Road intersects Old Maynard Road about 2.5 miles from the Koppers Superfund site. It is bordered on the north, south and west by the driveway from Old Maynard Road to the landowner's house and on the east by an adjacent property. This entire area is almost triangular in shape and consists of about 4.5 acres.

Many of the adjacent properties already have ponds and some landowners are planning expansion of their existing ponds. Man-made ponds are common in the area. Public acceptance of the implementation of the Habitat Mitigation Plan is therefore considered likely. Since no perennial streams will be dammed, water rights are not an issue. The addition of water habitat to the area will increase its use by wildlife. Existing drainage areas are not used agriculturally and therefore, pesticide and fertilizer runoff is not expected to affect the proposed site.

The land is under the ownership of the Seagondollar family. The present landowner is most willing to allow the Habitat Mitigation to be constructed on his property. Both he and the local soil conservation office had discussed development of a pond in the proposed area. A title search was conducted as part of the final design to identify ownership, easements, right of ways, liens and the possible existence of any other encumbrances. Beazer and Seagondollar have executed a conservation easement in anticipation of construction of HMP.

2.3.2 Medlin Pond Site

The Medlin Site is owned by Beazer East, Inc., thus no conservation easement or other related documents will be required. The site, which currently contains constituents of concern will be remediated as part of the Koppers Superfund site. The site is located just south of Koppers Road, across from the Fire Pond. The Medlin Pond area is about one acre in size and is roughly triangular in shape. Most of the adjacent property is industrial with the exception of the former property owner who lives adjacent to the site.

Since the site currently consists primarily of open water habitat, public acceptance of restoring the area to forested wetland habitat, which was probably the original habitat type, should be favorable. As a part of the remediation, the existing pond will be dewatered and regraded to accommodate the forested wetland habitat.

2.4 Topography and Geology

2.4.1 Seagondollar Site

The proposed mitigation area is located in an existing drainage swale that receives runoff from an area of approximately 11.5 acres. Elevations within this drainage basin range from about 310 to 350 feet above mean sea level. Drainage within the area of the 4.5 acre parcel is to the swale through the middle of the parcel. The slope of the channel is approximately 4.5 percent. Side slopes range from about 10 to 20 percent.

During the field investigation of the site, three test pits were excavated to determine the nature of the underlying residuum and to compare soils in the mitigation area to those encountered at the Koppers site. Logs from the test pits are included in the Field Investigation Report (Appendix A). Bedrock was encountered at approximately five feet below the ground surface in two of the three test pits excavated. The bedrock and overlying residuum encountered was similar to the Triassic sedimentary rocks which underlie the Koppers site.

Figure 2-2 shows the mitigation area which is underlain by interbedded Triassic sandstone and shale. The sandstone is composed of quartz, feldspar, and iron oxide. The sandstone has a high feldspar and clay content, which tends to make the rock less brittle (Parker, 1979) and weathered to create residuum having very low permeability. The interbedded shale and sandstone encountered have weathered to a dense dark red residual clay. Table 2-3 summarizes the geologic features of the existing habitat site and the proposed sites.

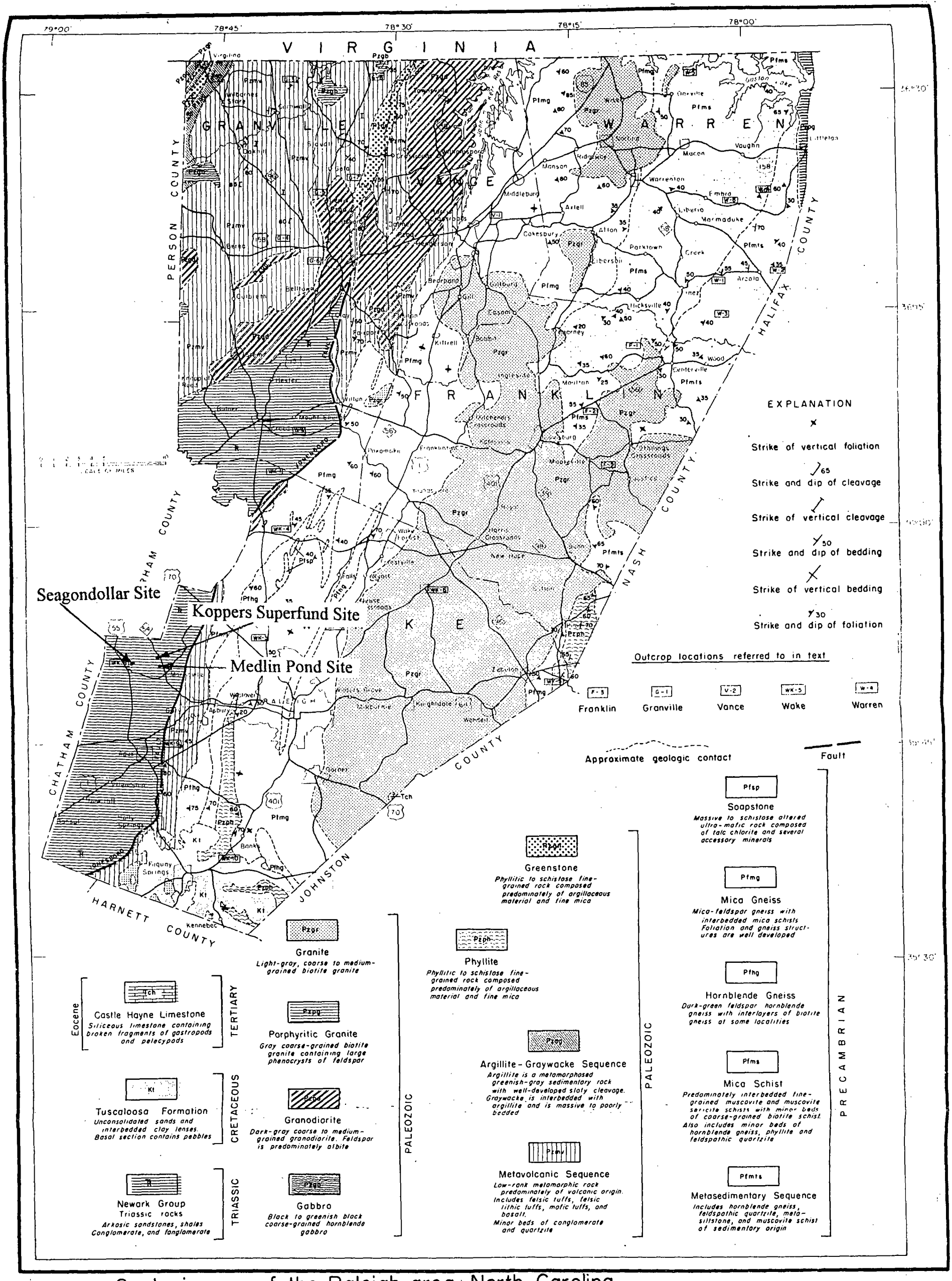
2.4.2 Medlin Pond Site

The Medlin Pond mitigation area is also located in an existing drainage swale. The Fire Pond drains into a culvert underneath Koppers Road and then flows into a drainage channel which leads to Medlin Pond. Because site remediation efforts will include draining Medlin Pond and backfilling it with 1-2 feet of fill, the underlying geology will not be altered for the construction of the wetland area. As described previously, the underlying features for this site are included in Table 2-3.

2.5 Soil Characteristics

Table 2-2 presents a summary of the soil types in the existing habitat units and the proposed site. The proposed soils at both the Seagondollar and Medlin Pond sites will be altered during construction to provide the appropriate growing medium for the vegetation.

The soil type or types within the area have a direct relationship to the amount of water which either infiltrates to recharge the groundwater or does not infiltrate and creates runoff. The nature of the subsoil determines the degree to which groundwater is recharged or surface runoff is discharged to surface water channels. Tightly compacted clay subsoils act as low permeability barriers which increase runoff.



Geologic map of the Raleigh area, North Carolina.

FIGURE 2-2

Raleigh Geologic Map
Ref: Groundwater Bulletin #15

TABLE 2-3

COMPARISON OF PHYSICAL FEATURES

EXISTING SITE	PROPOSED SITES
Newark Group	Newark Group
Triassic Sedimentary Rocks	Triassic Sedimentary Rocks
West of Jonesboro Fault	West of Jonesboro Fault
Creedmore - White Store Series	White Store Series Soil
Fire Pond created by damming head of intermittent stream	Proposed pond to be created by damming intermittent stream
Medlin Pond created by damming head of intermittent stream	Proposed forested wetland created by soil berms

Because the areas are at approximately the same elevations it is assumed that similar geologic features are present at each site. It has been reported that the beds occur within the Triassic Durham Basin and dip gently at about 5 to 12 degrees towards the Jonesboro fault. The strike is approximately parallel to the fault plane. The Jonesboro fault is the eastern boundary for these beds.

The soil survey map from the Soil Conservation Service (SCS) Soils Manual for Wake County, North Carolina (Cawthorn, 1970) is included as Figure 2-3, and shows both the proposed mitigation sites and the Koppers site. The soils in the Seagondollar mitigation area are White Store Sandy Loam (WsE) having 10 to 20 percent slopes. White Store series soils formed from weathering of Triassic sandstone, shale and mudstone. The surface layer is typically 6 to 8 inches of grayish brown to brown sandy loam. White Store consists of clay that is very firm when moist and plastic when wet. Triassic basin soils tend to have more swelling clays in their deeper horizons than other soils of the Piedmont (Reinemund, 1955). White Store soils have a high shrink-swell potential; these soils swell when wet to reduce infiltration and permeability which causes rapid surface runoff once the soil is saturated.

The low permeability of the White Store subsoil affects the morphology of minor drainage valleys in the Durham Triassic basin. Stream valleys are very wide and U-shaped to accommodate the large volume of surface runoff during extended periods of precipitation. Because of the steepness of the terrain, White Store soil is very susceptible to erosion. The White Store soil is described as not suitable for crops. Due to the combined effect of high runoff and steepness of the WsE soils, this soil type is found in forested areas where runoff is retarded by the organic matter and roots of the forest floor.

During the site field investigation three test pits, TP-1 through TP-3, were excavated to determine the condition and type of soils available on the property. The upper 6 to 8 inches consisted of organic material made up of roots, leaves and other forest debris. Beneath this surface layer was a clayey sand material which appeared to be moderately well drained. Two of the test pits encountered weathered bedrock at about 5 to 6 feet. However, at TP-2 water was encountered before refusal of the backhoe bucket was encountered. The test pit logs are presented in Appendix A.

Because of difficulty in accessing the upper section of the valley, no test pits were conducted in this area. Suitable soils may exist for use in constructing the habitat area. If suitable soils are not found, off-site soils will be used for construction of the ponds and wetlands.

2.6 Hydrologic Evaluation

The proposed mitigation sites do not have perennial water sources, therefore, the proposed wetlands and pond will rely on surface runoff and direct precipitation for providing water. Most minor streams in the Durham basin are ephemeral, and go dry during periods of no rainfall in the summer and early autumn. Although there is little to no baseflow in these streams, there is a large volume of discharge due to runoff during extended wet periods which occur seasonally in the winter and spring.

2.6.1 Seagondollar Site

The drainage swale that currently bisects the proposed Seagondollar site receives runoff from approximately 11.5 acres of surrounding undeveloped property. This runoff can be captured to sustain the proposed wetland and pond system. During the site investigations, many thriving local ponds were observed that rely solely on direct precipitation and surface runoff. (The Fire Pond on the Koppers Site is an example of a pond built at the head of an ephemeral stream.)

2.6.2 Medlin Pond Site

The proposed wetland at Medlin Pond receives runoff from approximately 21.4 acres of surrounding property. The drainage area includes the Koppers property and the remediated Fire Pond. This runoff will be detained to sustain the proposed wetland system.

Reliance on surface runoff will leave the system vulnerable to sustained drought conditions. Some of the plants may be lost during drought periods, but once the water is restored natural recovery of the wetland species should occur.

Table 2-4 summarizes the hydrological factors for the Koppers Superfund site habitat and the proposed sites. Various types of hydrologic regimes will be provided. As part of the design effort the hydrologic operation of the associated pond and wetland system were evaluated to ensure that the functional requirements are satisfied.

2.7 Overall Suitability

The goal of the Habitat Mitigation is to replace the values and functions of the habitat that will be impacted as a result of the remediation of the Koppers site. The values and functions provided in Section 2.1 of this report were the basis for design of the replacement habitat areas. Table 2-5 summarizes the advantages and limitations of the proposed mitigation sites.

2.7.1 Seagondollar Site

The Habitit Mitigation to be constructed at Seagondollar site will involve the enhancement of an area that currently contains mixed woodlands. The woodlands provide habitat for deer, small mammals and birds. Enhancement of the area will allow for the continual use of this area by those animals, but will also be available for migratory waterfowl, wading birds, muskrat and other semi-aquatic wildlife. The proposed habitat also includes some open water for fish habitat and shallow vegetated areas for fish breeding. In addition, the diversity of vegetation to be planted versus that which currently exists at the Koppers site will allow for more diverse wildlife use. Vegetative species were carefully selected for planting in the proposed replacement area. Many of these species, such as *Sagittaria latifolia* (duck potato), will be planted to entice migratory waterfowl and/or other wildlife.

Mitigation at this site will be out-of-kind as opposed to in-kind because there will be a different ratio of wetlands to open water habitat. Due to the common occurrence of man-made ponds in the area, open water was not considered critical. Instead, the plan is to construct a higher diversity of habitats which will include deep open water, shallow open water, submergent wetlands, emergent wetlands, scrub-shrub wetlands, and a special experimental area to contain rare insectivorous plants. These habitats,

TABLE 2-4

IMPORTANT HYDROLOGICAL FACTORS

EXISTING SITE	PROPOSED SITES
Wetland Units	
FP-3 Intermittently Exposed Fresh Water Located On Pond Fringe Relatively Permanent Water May be Exposed During Drought	A variety of hydrologic regimes is proposed. They will range from intermittently exposed to permanently inundated or seasonally inundated. This will allow for maximum diversity.
FP-7 Seasonally Flooded Fresh Water Located in Drainage Channel Receives Overflow Runoff Gets Intermittent Water	
Open Water	
Fire Pond Drainage Area = 9 acres Receives Only Surface Run-off	
Medlin Pond Drainage Area = 12 acres Receives Only Surface Run-off	

TABLE 2-5

ADVANTAGES AND LIMITATIONS OF PROPOSED HABITAT MITIGATION AREAS

Seagondollar Site

Advantages	Limitations
■ Not prime habitat	■ Limited area
■ Will improve habitat diversity	■ Partially wooded/some clearing necessary
■ Will improve habitat quality	■ Close to property line
■ Rural area	■ Absence of low permeability soils
■ No utilities to relocate	■ No permanent hydrology
■ Surface drainage will improve	
■ Good access for construction purposes	
■ Willing owner	
■ Conservation easement obtained	

Medlin Site

Advantages	Limitations
■ Not prime habitat	■ None
■ Will restore area to previous habitat	
■ Relatively secluded considering proximity to industiral use land	
■ No utilities to relocate	
■ The area will already be disturbed during remediation	
■ Access for construction not a problem	
■ Owned by Beazer East, Inc.	

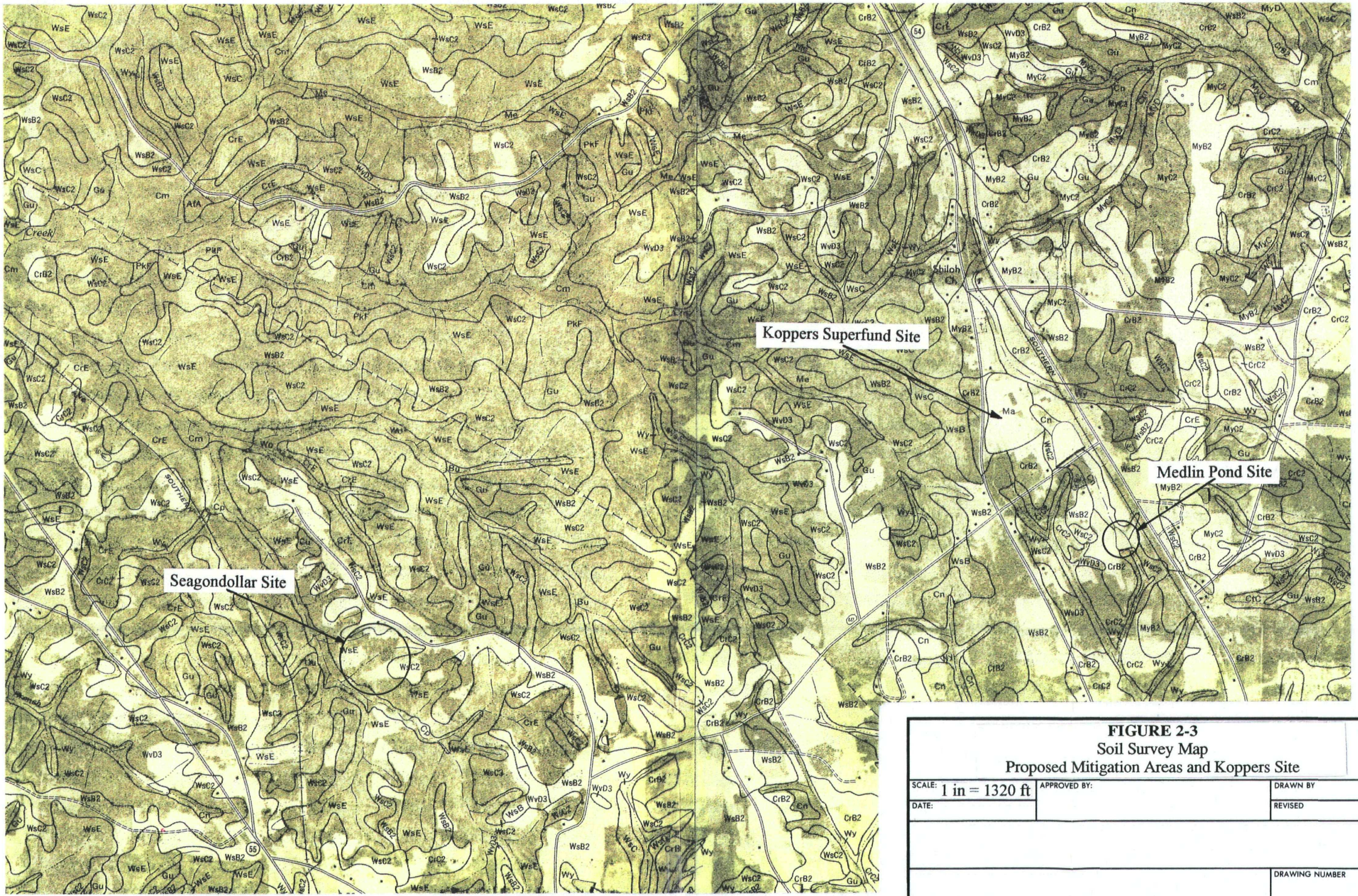


FIGURE 2-3
Soil Survey Map
Proposed Mitigation Areas and Koppers Site

SCALE: 1 in = 1320 ft	APPROVED BY:	DRAWN BY
DATE:		REVISED
		DRAWING NUMBER

once constructed, will be surrounded by the existing upland woodlands. Thus, a variety of diversity will be present for wildlife usage.

The Seagondollar site chosen for the replacement habitat is remote compared to the Koppers site and other developed areas in the Morrisville area. Since the open water habitat that will be lost during the remediation of the Koppers site is not of high value and is not scarce in the region, the concentration in design was placed on wetland habitat. The replacement habitat values and functions, from an ecological perspective, will be equal or greater values and functions to those impacted. Overall, the greater diversity of the replacement habitat will be more important to the ecoregion due to the scarcity of such habitat.

2.7.2 Medlin Pond Site

The Medlin Site will involve changing a man-made pond area that is currently part of the Koppers Superfund remediation project to a forested wetland. It is most likely that the area was a forested wetland prior to its transformation to a pond. Thus, this is somewhat of a habitat restoration as opposed to a habitat creation. The suitability of this site as part of the overall habitat mitigation appears favorable and appropriate.

Ponds, in general, are not scarce in the area. The change of habitat from pond to forested wetland will not displace wildlife from the area or cause stress to local or migratory plant or animal species. Advantages and limitations are listed in Table 2-5.

3.0 DESIGN CRITERIA

The design criteria for the replacement habitat consists of the functional requirements discussed in Section 2.0 and the facility requirements provided below. The facility requirements are provided separately for the wetland and open water units.

Wetland Units

It is assumed that units FP-3 and FP-7 will be affected by the remediation activities at the site. The area of each is about 0.75 and 0.55 acres, respectively, for a total of about 1.30 acres. It is important to note that although unit FP-7 may be affected to some degree by the remediation, some of this unit may survive due to its distance from the shores of Medlin Pond and its location in an existing drainage channel which is to remain. Therefore, the 1.30 acres may not be totally disturbed. In any case, it will be important to duplicate evenly the functions of each unit. The criteria that must be met in order to duplicate these functions and habitat will be:

Multi-Parameter Wetland Habitat - Seagondollar Site

- Establishment of a saturated root zone in most areas, and various temporarily/seasonally flooded areas.
- Topsoil (6 to 12 inches) to assure sufficient organic base for root propagation.
- Permanent water, though exposure during periods of drought would not be unreasonable.
- Retention of surface water runoff and providing wildlife habitat.

Seasonally Flooded Forested Wetland - Medlin Area

- Flooding with a few inches of water for a total of two weeks per year.
- Saturation of top 6 inches of surface for one month out of the year.
- Saturation of B-horizon soils (12-18 inches) for 2 months out of the year.

Open Water

Both the Fire Pond and the Medlin Pond will be dewatered and backfilled as part of the remediation. The total combined area of open water habitat is about 5.7 acres. Open water habitat is not as critical for the Morrisville area as is wetlands due to the large amount of this habitat in the general vicinity. However, the type of habitat available at the site will be duplicated to some extent. Open water habitat will be created at the Seagondollar site only. The criteria to be met for open water habitat will be:

- Varying depths of open water.
- The existance of cover along the banks and emergent wetland vegetation within the pond to develop areas for spawning and young to develop.
- Sufficient dissolved oxygen levels for fish to survive (approximately 5.0 mg/L or greater).
- Spillways or inlets designed to maintain water levels so that pressures will not exceed atmospheric in order to avoid gas bubble disease in fish.
- Maintaining water levels above 4 feet in the deeper portions of the open water.

- Temperatures below 32°C.

- Sediment buildup minimized by implementing appropriate sediment control measures.

4.0 DESCRIPTION OF THE DESIGN

4.1. Earthwork Design

4.1.1 Seagondollar Site

The Seagondollar property habitat mitigation is made up of three related water areas, one pond and two wetland units. The pond will serve as a water source for a wetland which will in turn provide water to another wetland. The layout of the units is shown on Figure 2 in Appendix D.

Existing topography of the site drainage area was used as much as possible, however, some grading will be required to impound the desired depth of water in each unit. The maximum height of fill is 12 feet and the maximum depth of cut is 10 feet. Fill will be needed for unit 3 and to construct dams for each of the units while a cut slope is included to provide additional wetland for area 2.

Figure 3 depicts typical cross sections through the Seagondollar mitigation area. Section A provides a view through wetlands 2 and 3; Section B provides a view of pond 1, wetland 3, and the dams for these two units; additional sections are provided to show transition between the pond and wetland areas.

Details on the types and estimated quantities of materials are provided in Section 2.2 of the Construction Specifications, Appendix B.

4.1.2 Medlin Pond Site

The Medlin Pond area will be remediated by dewatering the pond, regrading the dam, and filling in the pond area with 1 to 2 feet of cover soil. This area will then be restored to closely match the original (pre-pond) habitat of a forested seasonally flooded wetland. Regrading plans for the remediation of Medlin Pond show that the area will have a finished slope of approximately 1.3 percent. To assure the establishment of a wetland habitat, water will be temporarily retained by constructing a series of three low berms as shown on Figure 5. The maximum height of fill will be

18 inches at the center of the berm. Cross sections and details of the berms are shown on Figure 6.

4.2 Planting Scheme

A planting scheme has been developed for the mitigation areas. The types of plants and the approximate limits of each are shown on Figures 4 and 7.

Plant species were selected based on their availability, known hardiness in the general area, past success in wetland mitigation efforts and potential use by wildlife. Listed in this section are groupings of plants. Based on the wetness requirements of the plants. Plants were selected from each group and assigned to be planted in a specific zone within the mitigation area. There are 8 distinct zones to contain different dominant species.

The planting scheme drawings provided in Appendix D show these regions and the dominant selected species for each. These drawings also show the centers to be used when planting. Plants are not to be planted in rows, but are to be either grouped in small plots by species or mixed within their specific region. Listed below is a grouping of the vegetative species selected for the mitigation areas and the reasons for selection. The planting scheme drawings identify the proposed locations of each of these species. The approximate number of each species to be planted is also noted below.

Group 1 - Obligate Submerged Aquatic Herbaceous Vegetation

Vallisneria americana - An excellent all-around duck food. Also provides cover and food for fish and aquatic insects. Approximately 2000 of these plants will be planted in the 2-4 foot depths at the Seagondollar site.

Group 2 - Obligate Floating Herbaceous Vegetation

Nymphaea odorata - Redhead and canvasbacks eat the stems, roots and seeds. Many species of ducks, shorebirds and marshbirds utilize the rootstocks as a food source. Approximately 1000 of these plants will be planted in the 2-4 foot depths of the Seagondollar site.

Lemna minor - Widgeon, blue and green-winged teal, wood duck, coots, sora rail, geese, beaver, muskrat and other animals are known to feed on this valuable plant. This plant is often the primary diet for some species of ducks when other sources are not available, hence its common name "duckweed". Ten pounds of this tiny plant will be planted in the deep water portions of the Seagondollar site.

Group 3 - Obligate Emergent Herbaceous Vegetation

Nasturtium officinale - Generally remains green in winter, making it available for muskrat, deer and other mammals. Also provides significant habitat for aquatic insects. Approximately 1000 of these plants will be used at the Seagondollar site.

Alisma plantago-aquatica - Waterfowl eat the nutlets. Approximately 250 of these plants will be used at the Seagondollar site.

Sagittaria latifolia - This species is an excellent all-around waterfowl food. It also produces a long-lasting flower beneficial for insects. Approximately 1000 of these plants will be used at the Seagondollar site.

Pontederia cordata - This species provides food and cover for various species of ducks and produces an excellent long-lasting flower stalk used extensively by insects. Approximately 250 of these plants will be planted at the Seagondollar site.

Scirpus validus - A rapid spreading plant which produces seed eaten by marsh and shore birds and provides good cover and nesting for redwing blackbirds and marsh wrens. Muskrat feed on the roots and use the plant parts to build their dens. This species is recognized as one of the most important waterfowl food sources. Approximately 500 of these plants will be used at the Seagondollar site.

Peltandra virginica - Its berry-like seeds are relished by wood ducks. Many of the plant parts are eaten by muskrats. Approximately 2000 of these plants will be used at the Seagondollar site.

Iris versicolor - Excellent food and cover for muskrat, marshbirds and other species. Approximately 500 of these plants will be required at the Seagondollar site.

Iris pseudoacorus - Excellent food and cover for muskrat, marshbirds and other species. Approximately 500 of these plants will be required at the Seagondollar site.

Saururus cernuus - Excellent food source for wood duck. Approximately 250 of these will be planted at the Seagondollar site.

Carex lurida - Known food for yellow rails, various species of sparrows, snipe, grouse, snow bunting, larkspurs, and black duck. Approximately 2000 of these will be planted at the Seagondollar site.

Hibiscus moscheutos - Preferred nectar source for ruby-throated hummingbirds. Also, seed are eaten by bobwhite and ducks. Approximately 750 of these will be planted at the Seagondollar site.

Scirpus cypernius - Excellent food source for widgeon, black duck, canvasback, gadwall, mallard, mottled duck, pintail, ring-necked duck, ruddy duck, greater and lesser scaups, shoveler, teals, Canada and snow geese, trumpeter swan, long-billed dowitcher, Hudsonian godwit, sora and Virginia rails, semipalmated sandpiper, snipe and muskrat. Approximately 2500 of these will be planted at the Seagondollar site.

Group 4 - Experimental Insectivorous Plants

The following three species are uncommon, but known to occur or have occurred in the general vicinity. Their value to wildlife is relatively unknown/unstudied. Planting these species will enable the collection of pertinent data which may be vital to the species survival. Approximately 250 of each will be planted at the Seagondollar site. By monitoring the planting of these species, knowledge will be gained which may answer the following questions:

- Are these species suitable for use in constructed habitat projects?
- Are nursery raised plants suitable for use in the establishment/reestablishment of these species?

- What are the wildlife values of these species?

Dionacea muscipula - Venus flytraps have been collected (as a novelty) to depletion in many parts of North Carolina. Actual value to wildlife is unknown.

Sarracenia purpurea - Purple pitcher plants were once common. Bog habitats have been destroyed for development. Prior mitigation efforts sometimes overlooked reestablishment of the species and focussed on the more common/dominant species.

Drosera rotundifolia - Another bog species, so small and inconspicuous that it is often overlooked. Very delicate and sensitive to environmental disturbances.

Group 5 - Facultative Wetland Emergent Herbaceous Vegetation

Juncus effusus - Used as a food source by wildfowl, marshbirds and songbirds. Approximately 2500 of these will be planted at the Seagondollar site.

Lobelia cardinalis - Hummingbirds, orioles and butterflies eat the nectar. Approximately 500 of these will be planted at the Seagondollar site.

Group 6 - Facultative Wetland Shrubs

Salix niobe - Provides good wildlife cover. Shoots and buds are eaten by rodents, deer and rabbits. The buds and twigs are an important food for several species of grouse and the pine grosbeak. Both sites will be planted with this species. Approximately 3000 total will be planted among both sides.

Cornus stolonifera - Important food for bobwhite, grouse, common flicker, cedar waxwing, purple finch, eastern kingbird, eastern bluebird and raccoons. Good cover for wood ducks, American woodcock, gray catbird and goldfinch. Approximately 2500 of these shrubs will be planted among both sites.

Baccharis halimifolia - The primary function of this species is for cover. Many bird and mammal species that live in and around the constructed habitat will be able to utilize this species for cover. A total of approximately 1000 of these shrubs will be planted among both sites.

Group 7 - Facultative Wetland Trees

Quercus phellos - As with most oaks, this species has high value to many mammals and bird life (especially songbirds). It makes an excellent overstory tree and provides a good food source and cover. A total of approximately 100 of these trees will be planted among both sites.

Group 8 - Facultative Herbaceous Vegetation

Verbena hastata - The nutlets are eaten by marsh, shore and song birds; the plant is eaten by rabbits. Approximately 1000 of these plants will be used on the Seagondollar site.

Group 9 - Facultative Shrubs

Myrica cerifera - This shrub is a fast growing evergreen. Thus its value as initial cover is great. This species is known to fix nitrogen, a trait that may contribute to the quality of the soils in the immediate vicinity. Approximately 1500 of these shrubs will be planted on both sites.

Group 10 - Facultative Trees

Acer rubrum - Food for bobwhite, yellow-bellied sapsuckers, cardinal, evening and pine grosbeaks, squirrels and chipmunk. Cover and nesting for robins and American goldfinch. A total of approximately 1000 of these trees will be planted among both sites.

Liquidambar styraciflua - Sweetgum trees produce heavy crops of nutlets which provide many animals with a food source. A total of approximately 50 of these trees will be planted on both sites.

Nyssa sylvatica - The fruit is eaten by wood duck, game and song birds, fox, squirrel and raccoon. Deer also browse on the twigs and foliage. The Seagondollar and Medlin sites will be planted with approximately 1000 individuals of this species, total.

A description of the proposed planting scheme is provided in the next sections.

4.2.1 Seagondollar Site

The Seagondollar site will consists of eight distinct habitat types or zones as noted in Figure 4. Each zone will add its own unique characteristics to the area. In time, the zones will naturalize and shift in a given direction as certain species find their niche. Some species may die off if conditions are not appropriate and other species may move in naturally. As this process developes, the site will be monitored, as requried, noting the diversity of species and wildlife usage so that the values and functions of the site develop as planned.

Species proposed for Vegetative Zone A consist of 100% obligate hydrophytes. This zone will be saturated nearly all year, but may be subject to extended dryness during periods of drought. Most of the species chosen for this zone are hardy and can tolerate varied conditions, but will proliferate if the optimal 0-2 feet of standing water is present.

Vegetative Zone B will require standing water continuously and cannot tolerate periods of drought; thus these zones are designated in the deeper portions of the site.

Zone C will contain facultative and facultative wetland woody species. These shrubs and trees will be planted around part of the perimeter of the site and can tolerate seasonal fluctuations in hydrology, including zero saturation or inundation for moderate periods.

Zone D contains shrub vegetation that will be planted in roughly the center of the site. This centrally located cover area will be important for wildlife usage. The plants in this zone can tolerate significant dry periods, but prefer periodic saturation. Inundation is not prefered, but would probably be tolerated if to a minimal extent.

Vegetative Zone E contains tree species that prefer regular wetness. They can tolerate significant hydrological changes, but prefer regular flooding.

Vegetative Zone F contains predominantly emergent hydrophytes. They prefer saturated soils nearly all year, but can tolerate flooding. The obligate species in this zone (Carex lurida, Saurus cernuus, Scirpus cypernius and Hibiscus moscheutos) cannot tolerate dryness to much of an extent, tending to go dormant in these situations. They will then re-emerge if conditions improve.

Vegetative Zone G is the experimental unit containing insectivorous plants. These plants prefer bog conditions. They should have saturated substrate all year. It is uncertain whether they can tolerate drought conditions or periods of saturation, although this may be observed during this project.

The final zone of submerged logs will not be planted with any vegetation. This is the deep water area. The logs will provide habitat for the fish that are to be stocked as part of this project.

4.2.2 Medlin Site

The Medlin site will consist of a series of three small basins. Vegetation will be the same as Zones C, D,. and E at the Seagondollar site; For consistency of the design these zones were also designated as C, D, and E on the planting scheme drawing provided as Figure 7.

At the Medlin site, Zone E will be the wettest, followed by Zone D, then C. The wetness characteristic and other requirements and functions are the same as those listed in Section 4.2.1 for the respective zones at the Seagondollar site.

4.3 Fish Replacement

It is anticipated that replacement of fish will be accomplished by stocking the mitigated open water habitat at the Seagondollar site with fish species similar to those in the existing ponds with one exception. *Pimephales promelas* (fathead minnow) will be added as forage for the predatory fish to decrease initial predation of desirable species. The target species include: *Lepomis macrochirus* (bluegill), *Lepomis gibbosus* (pumpkinseed), *Micropterus salmoides* (largemouth bass).

4.4 Anticipated System Operation

4.4.1 Seagondollar Site

The Seagondollar habitat mitigation system will consist of a pond and two areas for wetland development. The system will be dependent on surface runoff from upland areas. Water is the single most important element for survival of the constructed wetlands.

Water budget calculations have been completed for the mitigation system design. The water balance model was performed using an off-site source to initially fill the pond. The calculations indicate that the system will reach normal operating conditions within the first year. The system is designed to maintain the appropriate pond depths and moisture conditions for growth of the wetland plants for the mean yearly conditions. These calculations are discussed below.

The water budget method evaluates the inflow, water storage, water losses, and outflow for the designed system. Inflow enters the system from direct precipitation, upland area runoff, and overflow from the upper tier pond and or wetland. The inflow is stored in the system as soil moisture and as standing water. Water losses primarily consist of evapotranspiration and subsurface leakage. If the water holding capacity of the system is exceeded, then direct outflow of water will occur. The habitat mitigation system proposed is a three-tier system consisting of one upper pond and two lower wetland areas. Therefore, for this design, overflow from the upper units is desirable.

Monthly and daily water balance models are provided in Appendix C, Calculations. The pond depth varies from 0 to 4 feet average, the actual maximum depth is about 8 feet. The depth of standing water in the wetland units varies from 12 to 18 inches. Additionally, the perimeter of the pond will provide wetland habitat.

4.4.2 Medlin Pond Site

The Medlin Pond presently receives drainage from approximately 21.4 acres. The drainage area will not be substantially changed by the remediation of the Koppers site and should provide adequate runoff to sustain the proposed wetlands.

Water budget calculations have been completed for the wetlands and are provided in Appendix C. The system is designed to maintain the appropriate conditions for growth of the wetland plants for the mean yearly conditions as described in Section 3, Design Criteria.

4.5 Erosion and Sediment Control Plan

An Erosion and Sedimentation Control Plan has been prepared consistent with the North Carolina Erosion and Sediment Control Planning and Design Manual. This plan is included as Attachment 2.

4.6 Sources of Materials

Excavated site soils will be used to the maximum extent possible at the Seagondollar site. Topsoil will be stripped and stockpiled for use as the final vegetative soil layer, other site soils will be sampled and tested to determine if they are suitable for use as the low permeability liner material. Section 6 of the Construction Specifications provides additional information on earthwork activities at the Seagondollar site.

The Habitat Mitigation Plan for the Medlin Pond site will be constructed after remediation of the pond is completed. No excavation is to occur and all soil needed to construct the berms will be supplied from an approved off-site source. Section 7 of the Construction Specifications provides additional information on earthwork activities at the Medlin Pond site.

5.0 PLAN FOR SATISFYING PERMIT REQUIREMENTS

This section identifies the permits required to support construction activities associated with habitat mitigation. It also provides a plan for obtaining the necessary approvals.

Typically construction requires the approval of federal, state, and local government agencies prior to initiating land disturbance activities. The Agency or Agencies involved depends on the location and size of the mitigation project. The current mitigation project for the Seagondollar property is expected to require the grading of a land parcel with a total area of less than three acres. The resulting pond will impound less than four acre-feet of water. The dam associated with the pond will be a maximum of 12 feet high. Because this is a relatively small project, agency involvement is limited.

Upon approval by US EPA of the design, the appropriate project information will be submitted to the following agencies in the sequence presented below:

- A site location drawing and project design drawings to the U.S. Army Corps of Engineers (Corps) to determine if a permit is required. The Corps is responsible for approving the construction of ponds in streams or wetlands.

- A site location drawing and project design drawings to the North Carolina Division of Land Quality to determine if a dam safety permit is required. A dam safety permit is required if the dam being constructed will be equal to or greater than 15 feet high, impounds ten or more acre-feet of water, or the danger to human health downstream of the structure is considered high.

During the Habitat Mitigation Remedial Action (Construction Phase), several permit items will need to be addressed. These include submission of the Erosion and Sediment Control Plan to the Towns of Morrisville and Cary and the NC Division of Environmental Management, obtaining an environmental grading permit as well as a determination regarding the applicability of a general construction activities NPDES permit. In most instances, the Division requires a general NPDES permit for land disturbance activities involving more than five (5) acres.

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